



AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No. 10/787,406

Attorney Docket No. Q80151

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (currently amended): A wiring substrate, in which a wiring stacked portion including a conductor layer and a resin layer is stacked on a principal face of a core substrate including a substantially cylindrical through hole conductor in a through hole extending therethrough and a filling material comprising a resin filling a hollow portion of said through hole, comprising:

a cover-shaped conductor portion covering an end face of said through hole just above a principal face of said core substrate and connected to said through hole conductor; and

a terminal pad conductor provided over a principal face of said wiring stacked portion for disposing connection terminals used for connections with an external device,

wherein a connection portion composed of via conductors buried in said resin layer brings said cover-shaped connection portion and said terminal pad conductor into conduction,

~~and~~ said via conductors are filled vias,

said via conductors composing said connection portion are provided not above a center axis of said through hole, and

the filling material of the through hole has a coefficient of thermal expansion higher than that of the material constituting the filled vias.

2. (previously presented): The wiring substrate according to claim 1, wherein said via conductors are provided not above said filling material in said through hole conductor.

3. (canceled).

4. (original): The wiring substrate according to Claim 1, wherein, of said via conductors, the via conductors to be connected with said terminal pad conductor are provided not above said through hole.

5. (previously presented): The wiring substrate according to claim 1, wherein, of said via conductors, the via conductors on a side of said terminal pad conductor are more spaced above said through hole from a center axis of said through hole than the via conductors on a side of said cover-shaped conductor portion.

6. (original): The wiring substrate according to claim 1, wherein said connection portion has a stacked via structure, in which a plurality of filled vias are substantially concentrically contiguous to each other at positions other than that above said through hole.

7. (original): The wiring substrate according to claim 1, wherein said through hole is out of position below a center axis of said terminal pad conductor.

8. (currently amended): A wiring substrate comprising:

a core substrate including an insulating substrate, a through hole provided through the insulating substrate, a substantially cylindrical through hole conductors formed on an inner circumference of said through hole, and a filling material filling a hollow portion of said through hole conductors;

a cover-shaped conductor layer provided on at least one principal face of said core substrate and in a shape containing an end face of said through hole and having conduction to said through hole conductor;

a plurality of resin layers provided over said cover-shaped conductor layer;

a ball pad conductor provided over said resin layers and having solder balls to be connected with connection terminals of an external device; and

a connection portion including via conductors buried individually in said resin layers for bringing said cover-shaped conductor layer and said ball pad conductor into conduction,

wherein said via conductors are ~~made of~~ filled vias,

the filling material of the through hole has a coefficient of thermal expansion higher than that of the material constituting the filled vias, and

in case a through direction of said through hole is a center axis direction, an individual center axes of said via conductors composing said connection portion and said ball pad conductor are not aligned with the center axis of said through hole.

9. (previously presented): A wiring substrate comprising:

a core substrate including an insulating substrate, a through hole provided through the insulating substrate, a substantially cylindrical through hole conductors formed on an inner circumference of said through hole, and a filling material filling a hollow portion of said through hole conductors;

a cover-shaped conductor layer provided on at least one principal face of said core substrate and in a shape containing an end face of said through hole and having conduction to said through hole conductor;

a plurality of resin layers provided over said cover-shaped conductor layer;

a ball pad conductor provided over said resin layers and having solder balls to be connected with connection terminals of an external device; and

a connection portion including via conductors buried individually in said resin layers for bringing said cover-shaped conductor layer and said ball pad conductor into conduction,

wherein the via conductor of said connection portion, which is connected to said cover-shaped conductor layer, is composed of conformal vias whereas the remaining via conductors are composed of filled vias, said conformal vias having a hole wall, a metallic material arranged along the hole wall, and a resin material filling the remaining portion of the hole, and

in case a through direction of said through hole is a center axis direction, an individual center axes of said via conductor composed of said filled vias and said ball pad conductor are not aligned with the center axis of said through hole.

10. (original): The wiring substrate according to claim 1, wherein a center axes of said via conductors are spaced by 50 μm or more and 300 μm or less from a center axis of the through hole.

11. (previously presented): The wiring substrate according to claim 1, wherein the substantially cylindrical through hole conductor is formed on an inner circumference of the through hole.

12. (previously presented): The wiring substrate according to claim 8, wherein said filling material filling a hollow portion of said through hole conductors comprises a resin.

13. (previously presented): The wiring substrate according to claim 9, wherein said filling material filling a hollow portion of said through hole conductors comprises a resin.

14. (new): The wiring substrate according to claim 1, wherein the filled via conductors of the connection portion are made of a metallic material.

15. (new): The wiring substrate according to claim 8, wherein the filled vias of the connection portion are made of a metallic material.